Always On™
UPS Systems Inc.

Genie Smart Cabinet - UPS Powered Distribution Unit
User Manual

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1. Caution

This user manual is for installation and operation purposes only.

Do not attempt to apply power to the input terminals of the Genie Cabinet system until factory authorized personnel check connections.

Factory authorized personnel shall inspect installation prior to start up and commissioning to validate warranty.

Failure to follow this directive will void the warranty

NOTE

The instructions contained in this manual are not intended to cover all of the details or variations in equipment, or to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred directly to Always On UPS Systems.

Any electrical or mechanical modifications to this equipment, without prior written consent of Always On UPS Systems, will void all warranties and may void CSA listing. Unauthorized modifications may also result in personal injury, death, and damage to the equipment.

2. Important Safety Instructions

READ AND FOLLOW ALL SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS.

This manual contains important safety instructions that should be followed during installation and maintenance of the Genie Breaker Cabinet system and optional packages. Before the installation process begins, we recommend that the installer read through the safety precautions, and the instructions, taking all necessary safety precautions to protect themselves and the equipment being installed.

GENERAL

- Move the Genie Breaker Cabinet in an upright position, in its original packaging, to its final destination.
- To lift the cabinet use a forklift or lifting belts with spreader bars.
- Check the integrity of the Genie Cabinet equipment carefully.
- If visible damage is evident, do not attempt to install or start the Genie Breaker Cabinet. Contact the transport delivery company immediately, file a claim with the transport company and inform Always On directly.
- Do not use outdoors.
- The use of accessory equipment not recommended by Always On may cause an unsafe condition
- WARNING! RISK OF ELECTRICAL SHOCK: use extreme caution when removing covers.
- All maintenance and service work should be performed by qualified and trained service personnel.
- Do not use this equipment for other than intended use.

INSTALLATION

- This Breaker Cabinet is intended for use in a controlled indoor environment free of conductive contaminants and protected against any type of intrusion.
- Do not install the Breaker Cabinet in an excessively humid environment or near water.
- Avoid spilling liquids and/or dropping any foreign object(s) onto the Breaker Cabinet.
- The unit must be placed in a sufficiently ventilated area; the ambient temperature should not exceed 40°C (104°F).
- HIGH GROUND LEAKAGE CURRENT: ground connection completed before connecting the AC voltage wires on the input!
- Avoid locations in direct sunlight or near heat sources (gas or electric heaters).

STORAGE

- Store the Genie Breaker Cabinet in a dry location free of contaminants.
- Storage temperature must be within -25°C (-13°F) to 55°C (131°F).

WARNING!
LETHAL VOLTAGES MAY BE PRESENT WITHIN THIS UNIT EVEN WHEN IT IS APPARENTLY NOT OPERATING. OBSERVE ALL CAUTIONS AND WARNINGS IN THIS MANUAL. FAILURE TO DO SO COULD RESULT IN SERIOUS INJURY OR DEATH. REFER UNIT TO QUALIFIED SERVICE PERSONNEL IF MAINTENANCE IS REQUIRED. NO ONE SHOULD WORK ON THIS EQUIPMENT UNLESS THEY ARE FULLY QUALIFIED TO DO SO. AN INSTALLER SHOULD NEVER WORK ALONE.

THIS SAFETY NOTICE IS ADDRESSED TO THE ALWAYS ON CUSTOMER ENGINEERS WHO PERFORM MAINTENANCE OF THE GENIE BREAKER CABINET.

Electrical Safety

- Maintenance work to be preformed by a factory trained customer engineers, or qualified personnel. Extreme caution must be used.
- This manual is designed as an aid tool in diagnosing problems that may arise. Always On does not assume responsibility if information causes injuries.
- Apart from the front door, do not open any other part of the Breaker Cabinet without consulting the factory first.

READ AND FOLLOW ALL SAFETY INSTRUCTIONS. SAVE THESE INSTRUCTIONS.

3. Introduction

Congratulations on your choice of the Always ⏻n UPS Systems Genie “Smart” Cabinet Power Distribution Unit. This breaker cabinet features the latest top of the line breaker technology which provides effective protection for all loads behind a UPS.

Overview
This Cabinet is designed for installation between your UPS and your critical loads. It distributes the power provided through the UPS to your equipment at all times, while protecting your equipment from any short circuits.

Features
This Genie “Smart” Cabinet uses Genie Breakers, which operate with the benefits of fuse-like shutdown capacity and the reset abilities of a normal breaker. In addition, the system has been designed with technology to allow the breakers to be swapped in and out while still powered. Another feature that may be included is Breaker Status Ports, which make use of the Normally Closed and Common Dry Contacts on the Breakers, so that the status of the breakers can be monitored electronically.

4. Unpacking

Transport

- The Genie Breaker Cabinet is packaged on a pallet, suitable for handling with a forklift.
- Pay strict attention to the center of gravity. The cabinet must be moved in upright position. Do not tilt cabinets more than +/- 10° during handling.
- Move the cabinet in its original package to the final destination site.
- Do not stack other packages on top.
- If the cabinet must be lifted by crane, use suitable lifting straps and spreader bars.

Delivery

- Upon receiving the Genie Breaker Cabinet, inspect the packaging integrity and the physical condition of the container carefully.
- In the event that physical damage is visible, the carrier must be informed immediately and a claim filed with them. Inform Always On as soon as the claim has been filed and a copy of claim should be faxed to Always On at (250) 491-9775.
- A detailed report of the damage is necessary for carrier insurance claim.

  WARNING
  A damaged Genie Breaker Cabinet must never be installed or connected to the utility without written instruction from Always On Engineering.

Storage

- The Genie Breaker Cabinet is carefully packed for transport and storage.
- Never leave a Genie Breaker Cabinet outside the building exposed to the elements and do not place other packages on the top of the Genie Breaker Cabinet.
- Storing: It is recommended to store the Genie Breaker Cabinet in its original package in a dry, dust-free room, away from chemical substances, and with a temperature range of -25°C (-13°F) to 55°C (131°F). Exceeding this temperature range may cause damage.

Site and Environment Consideration

The following precautions and recommendations should be checked when considering the site and environment for the Genie Breaker Cabinet:

- Void space is not required on all sides of the Genie Breaker Cabinet, but adequate space, a minimum of 1m (3’), should be allowed for the doors to open.
- Avoid accumulating litter or trash of any sort in or around the Genie Breaker Cabinet system. The floor area surrounding the Genie should be kept clean, free from metallic powder and/or filings.
- The system, when installed in a sprinkler equipped room, must have a sprinkler guard installed.
- Do not place the Genie Breaker Cabinet near any heat source, or machinery, which may produce metallic particles, dust or powder. Do not place the Genie Breaker Cabinet near equipment that will produce corrosive substances or vapor.

- Do not place the Genie Breaker Cabinet below the shower of a fire extinguishing system.
- The user is required to guarantee the temperature and humidity values of the site into which the Genie Breaker Cabinet will be installed meet the required and published manufacturer specifications. The Genie Breaker Cabinet should be installed within the range allowed by these specifications. The Genie Breaker Cabinet is capable of continuous normal operation within a temperature range of 0°C (32°F) to 40°C (104°F). For optimal performance and reliability the recommended environment temperature is best at 25°C, with humidity < 80% non-condensing.
- Access to the Genie Breaker Cabinet should be limited to operation and maintenance personnel. The Cabinet should be kept locked and secure.
- Personnel who operate or maintain the Genie Breaker Cabinet should be proficient in normal and emergency operational procedures. New personnel should be trained and qualified prior to operation of the equipment.

Unpacking

- Carefully remove all the packaging material of the Genie Breaker Cabinet and then carefully place the Genie Breaker Cabinet at the final resting site.
- This Genie Breaker Cabinet has passed all stages of production testing and final stage QC testing prior to shipment from the factory (report enclosed). The Genie Breaker Cabinet should be in full operating condition upon receipt. Upon receiving visually check the Genie Breaker Cabinet for any physical damage that may have occurred during transport. If damage is noticed, file a damage report immediately with the transport company and inform Always On.
- Check to ensure all of the accessories/options ordered are received.
- Check and verify the specifications of the Genie Breaker Cabinet are identical to the specifications of the system ordered. The key items in the specifications you must check are:
    - CIRCUIT BREAKERS INSTALLED
    - VOLTAGE
    - CURRENT RATINGS

5. Genie Breaker Cabinet Theory

Short Circuit Comparison Study - Thermal Breaker vs "GENIE" Breaker
Short circuits within a system will cause the voltage to drop to ~0V and the current will spike well above the nominal range (1000% and greater) until the short circuit condition has been removed (see Figure 1).

Figure 1: 15A Federal Pioneer Breaker on 100 feet of 14AWG wire

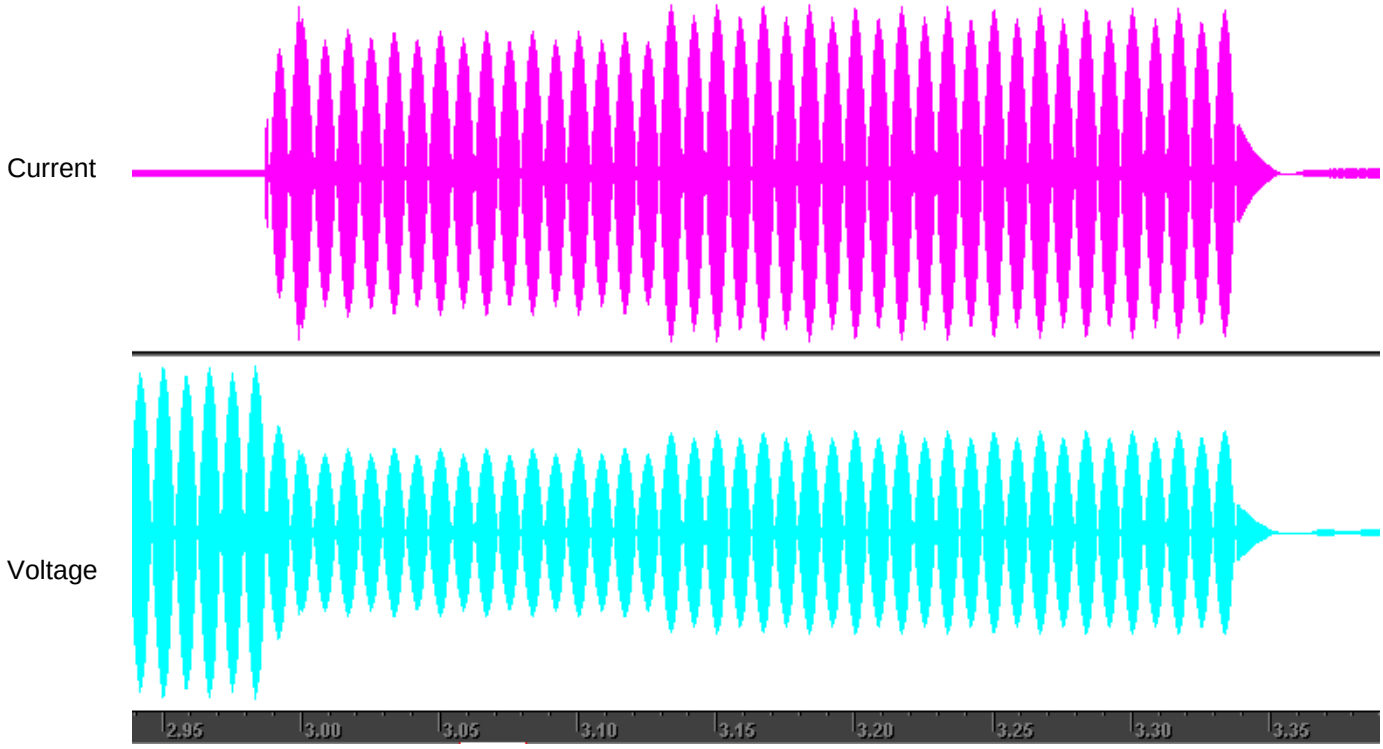


Figure 1: Voltage and Current Waveforms during a typical Short Circuit

As Figure 1 demonstrates, the voltage drops below operating capacity and the current is well above nominal until the breaker trips and clears the fault.

If the load was connected with no disconnect protection, the voltage in Figure 1 would drop to ~0V and the current could rise to thousands of amps until a means of disconnect somewhere in the stream tripped or the equipment burned out.

When an Always On UPS system has been added to the circuit, the UPS has customized operational features that limit the current to a 3:1 crest factor in accordance with Always On specifications.

The crest factor is the maximum current that the inverter will supply over a short duration (approximately 2 ½ cycles). A crest factor of 3:1 means that the inverter can supply 3 times the RMS current rating of the inverter (i.e.: a 2kVA inverter produces a 16A maximum output, so the maximum peak current is 48A).

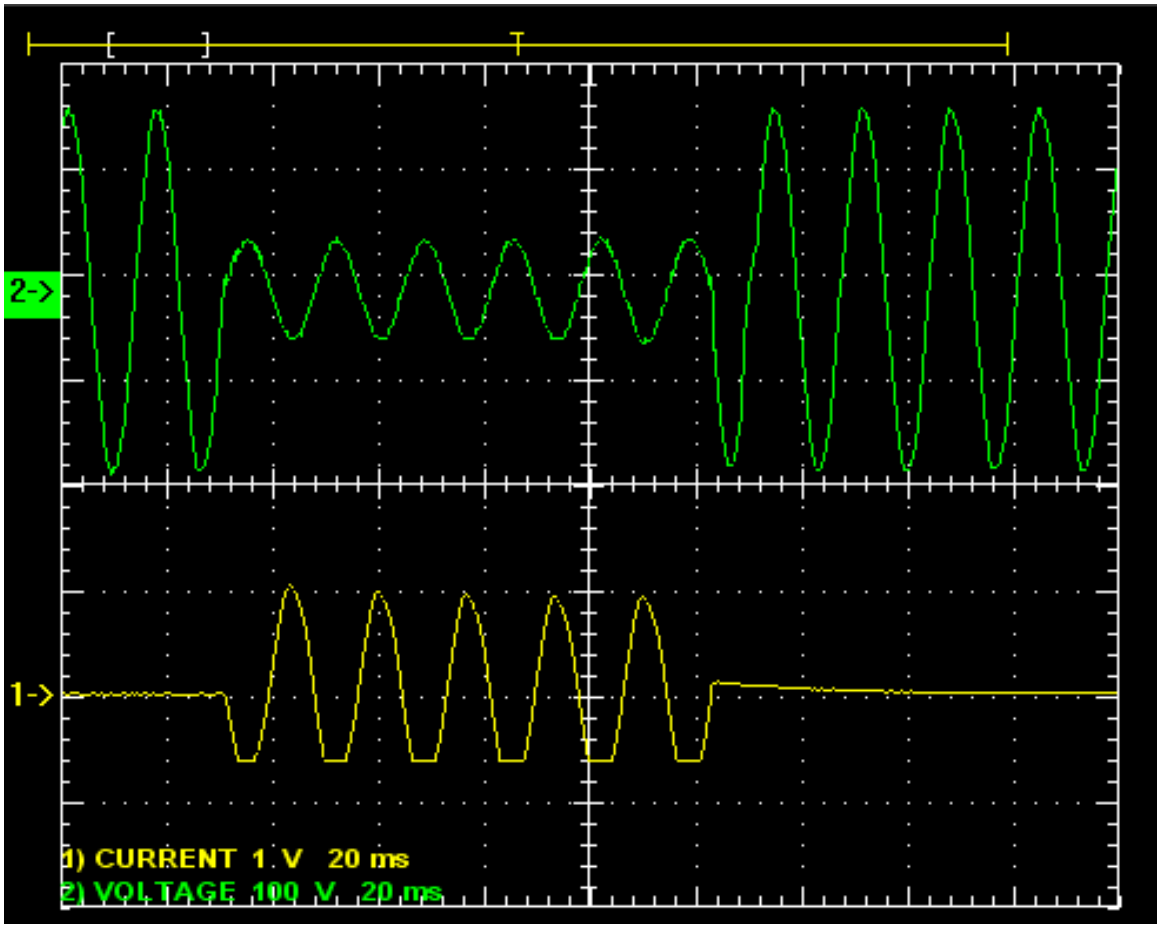


Figure 2: Typical UPS Output Short Circuit Waveform with UPS on bypass

The figures above presume the load is connected to a standard thermal breaker that typically takes 5 to 22 cycles to clear (depending on the manufacturer and model).

The inverter is rated to the current limit for 2 ½ cycles before inverter shutdown. Then, depending on the configuration, the system will either turn off or switch to bypass mode (See Figure 2 for switched to bypass and Figure 3 for system shutdown). In the event that the system is configured to switch to bypass mode, the load is essentially connected directly to the utility and power will be provided until a means of disconnect is tripped or the equipment burned out. This migrates the short circuit to the rest of the power system that affects the other loads.

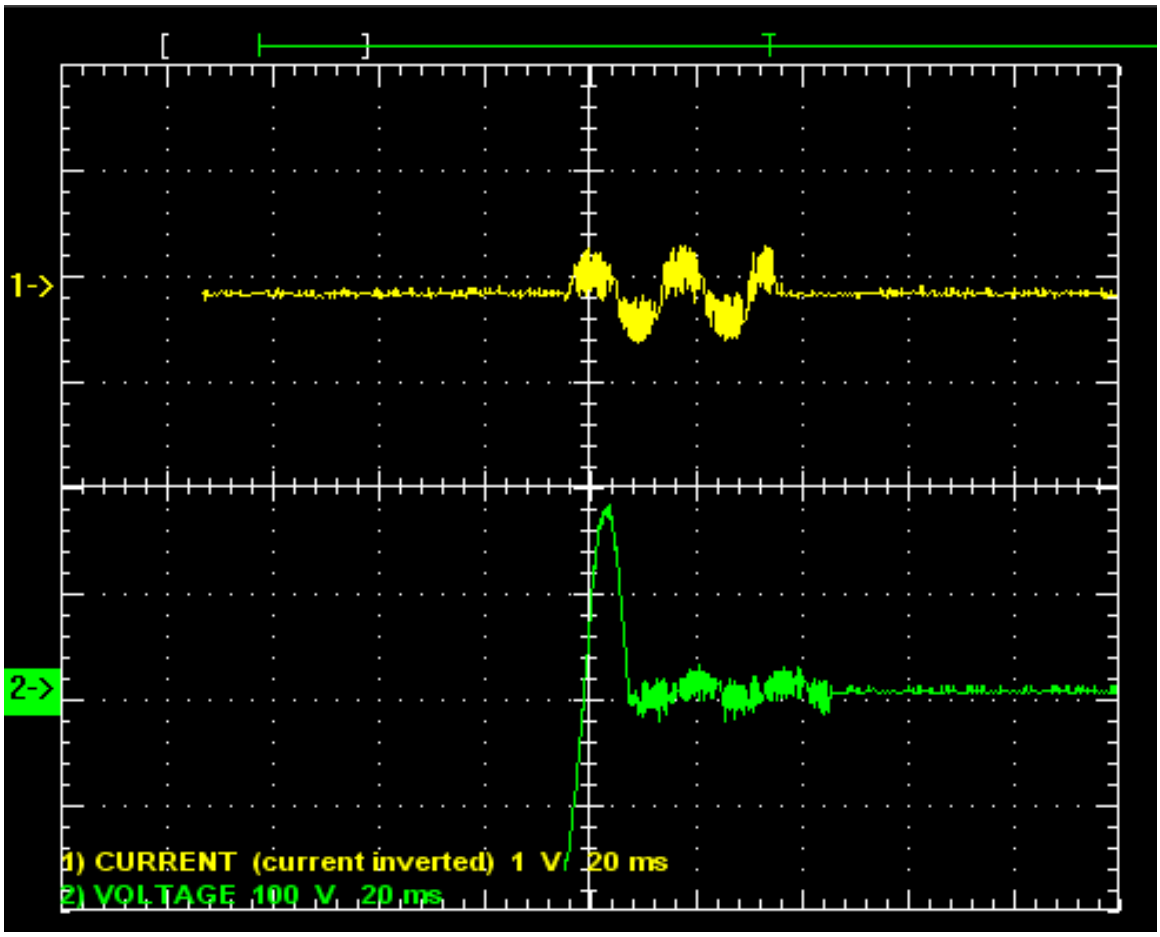


Figure 3: Typical UPS Output Short Circuit Waveform with UPS on inverter only

Both these scenarios will cause any additional loads connected to the distribution cabinet to shut down due to lack of voltage (simulated blackout).

Always On has designed and patented a new specifically designed breaker (SDB). The SDB incorporates technology to monitor the waveform and compare the symmetry of the positive and negative wave cycle as well as the energy content over that cycle. This allows the SDB to detect a symmetrical waveform from the inverter current (see Figure 4) during a short circuit.

The SDB allows the problem circuit to trip within 1 to 1 ½ cycles. The majority of power supplies are designed and required to comply with the ITI/CBEMA standard, which states that the power supply must be able to withstand a short duration of loss of power. Therefore, in the event of a short circuit, the additional systems connected to the Always "On" "GENIE" distribution cabinet will be protected to the maximum level.

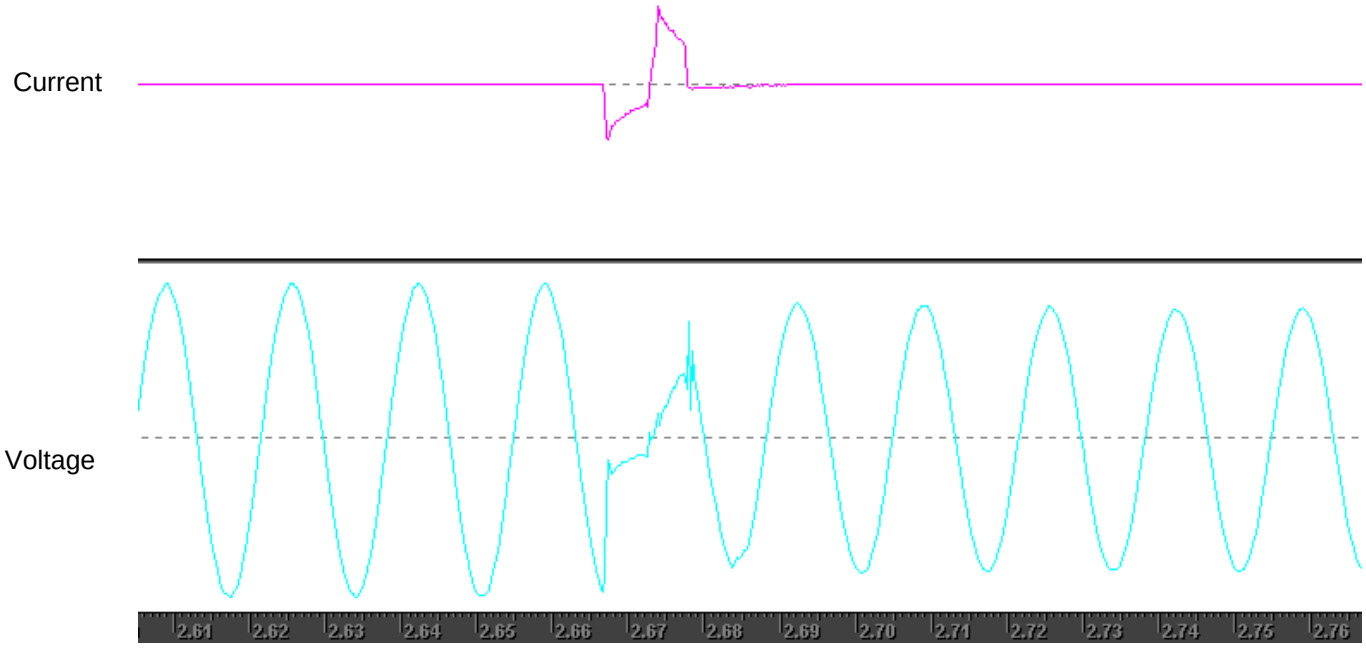


Figure 4: Voltage and Current Waveform of a 15A SDB

Short Circuit Testing: 30kVA
Here are the results of a comparison test preformed in our Kelowna factory. The tests were performed on a 30kVA 3-phase UPS system with various types of protection devices.

System Information:
Model : GES – 303NX33
Capacity of UPS: 30kVA 120/208//120/208 VAC
S/N 04049050

Testing Date: 04/10/19

Equipment used:
Tektronix TDS 3012 100MHz, 1.25 GS/s
Current Probe: Fluke 80i-500s AC, 1A to 500A AC RMS
Analyzing Software: WaveStar for Oscilloscopes

Method:
- Line to Neutral short circuit was introduced to the UPS Inverter output.
- Response between fuse, standard breaker and the “GENIE” Breaker were observed.

Note:
Tests performed with a 30kVA 3-phase UPS system.
The UPS system is configured to switch to bypass after three cycles.

Report Prepared by: AA, JA

Short Circuit Inverter Mode Test 1
Tested with a MDL 15A Fuse
Note: UPS stayed in Inverter Mode – fuse opened (0.5 cycle)

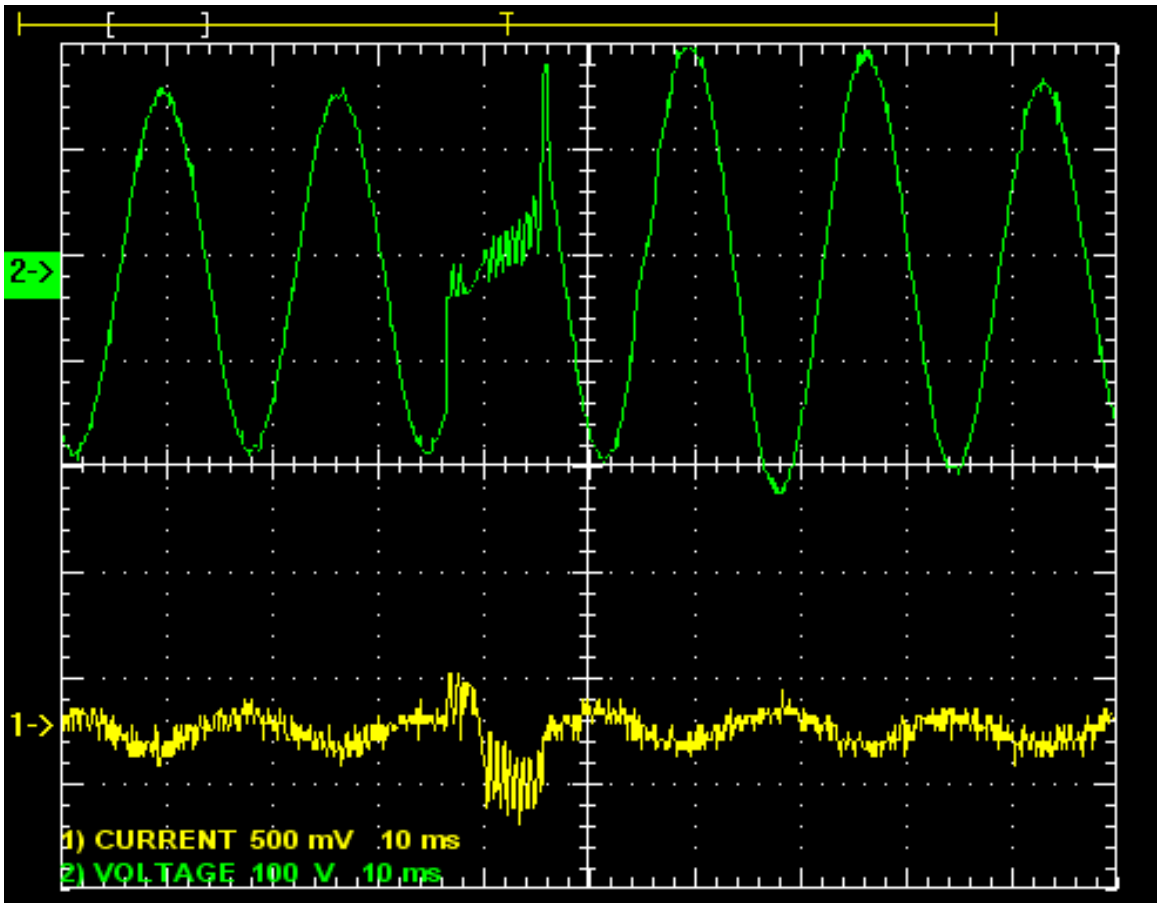


Figure 4: Current and Voltage waveform short circuit MDL 15A Fuse

Short Circuit Inverter Mode Test 2
Tested with a Federal Pioneer 15A breaker
Note: Breaker tripped in 5 ½ cycles.
UPS system went to bypass and waited until breaker cleared.

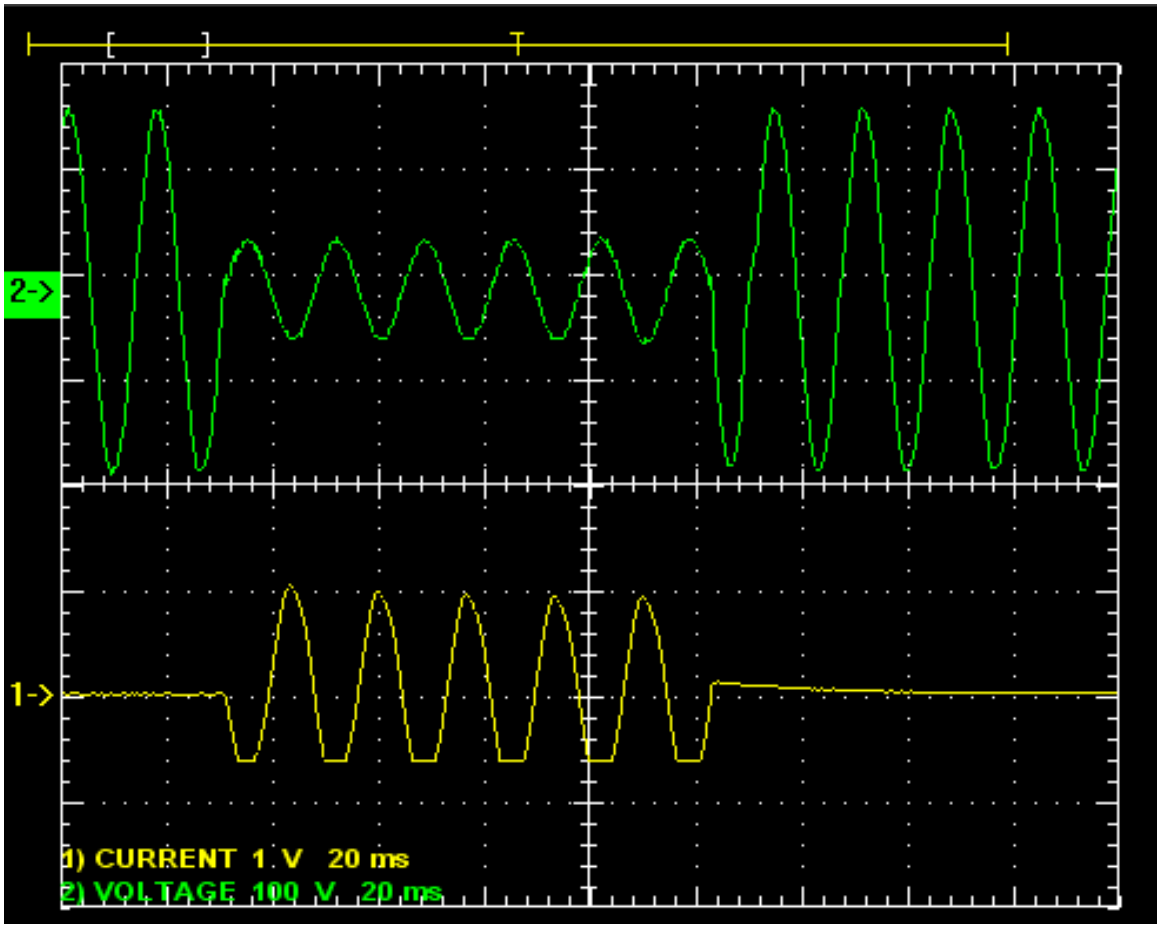


Figure 5: Current and Voltage waveform short circuit Federal Pioneer 15A breaker

Short Circuit Inverter Mode Test 3
Tested with a 15A SDB (Specially Designed Breaker)
Note: UPS stayed in on-line mode (Inverter Mode)
SDB opened within ¾ of a cycle.

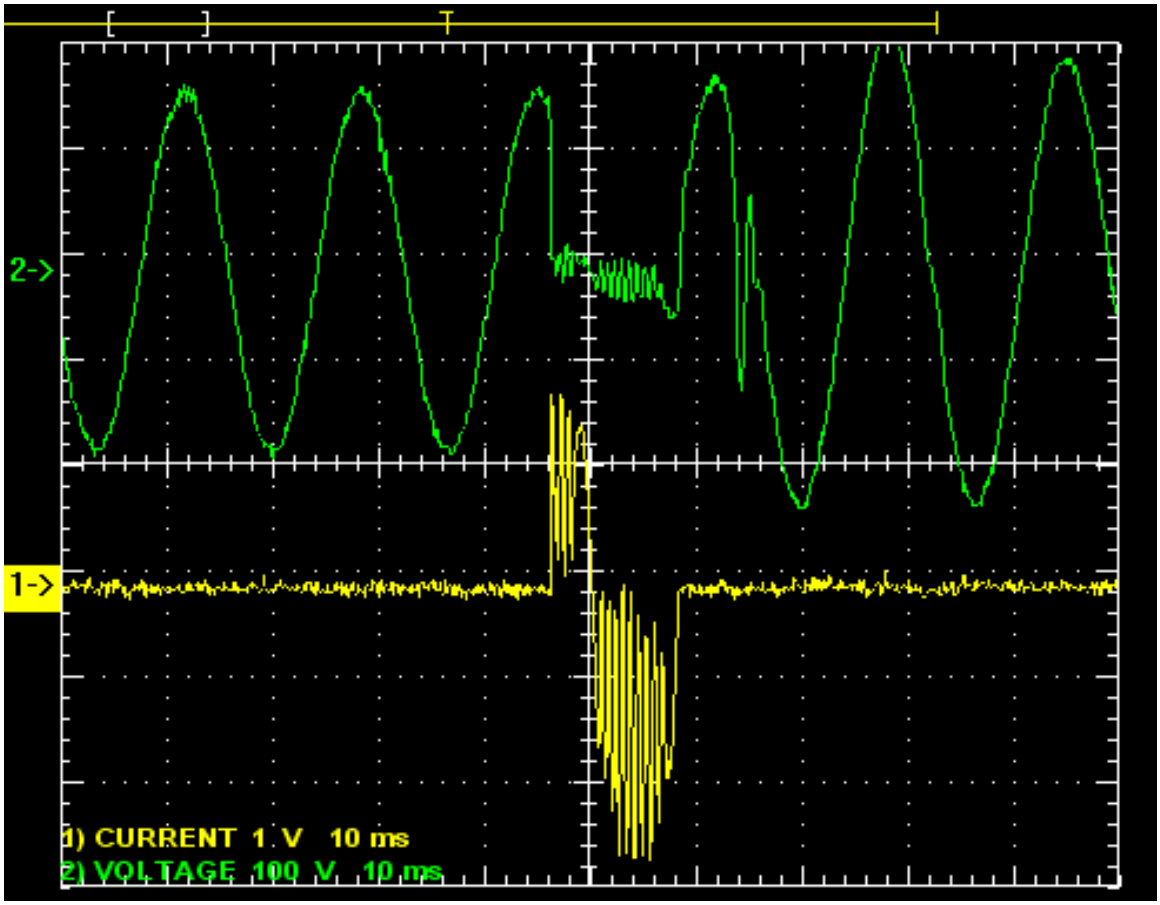


Figure 6: Current and Voltage waveform short circuit 15A SDB

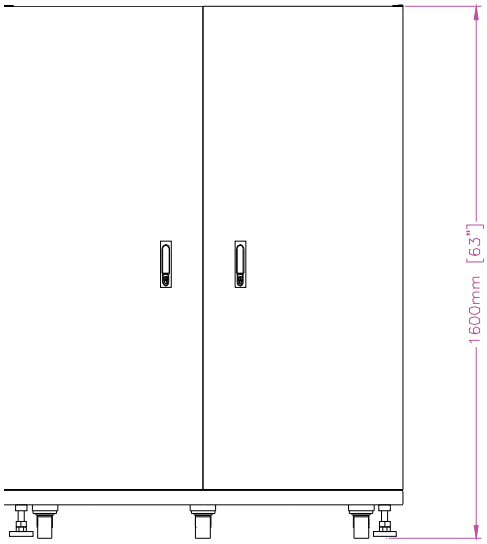
Conclusion:
As the above test results show, the Specifically Designed Breakers (SDB) is easily resettable like a standard breaker. It also incorporates the best attributes of a fuse. The SDB reacts and clears the fault within one cycle, providing the fast reaction time of a fuse, and can be reset the same way as a breaker (after the fault has been cleared). Because of the fast reaction of the SDB, the UPS system supplying the cabinet remains on-line. The other loads connected to the distribution cabinet with the SDB's does not detect the short circuit on the problematic branch (Note: based on ITI/CBEMA standard mentioned earlier).

These advantages make the SDB in combination with the "GENIE" cabinet the most reliable means of distribution for any type of critical environment based on sensitivity or demand (i.e.: hospitals, server rooms, control centres, air traffic towers, etc.).

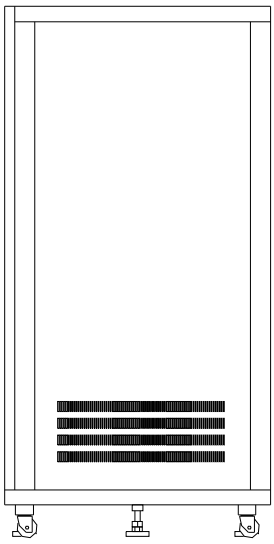
6. Installation

WARNING!
The Genie Breaker Cabinet should be installed by a qualified technician or personnel and wired in accordance with local and national electrical codes. Be sure the polarities and voltage match the rating of the unit. Check that the loads being protected are within the capacity of the system. Ensure no power has been applied to the systems and nothing has been turned on before proceeding.
FOR PROJECT SPECIFIC DRAWINGS AND INFORMATION PLEASE REFER TO MANUAL ADDENDUM.

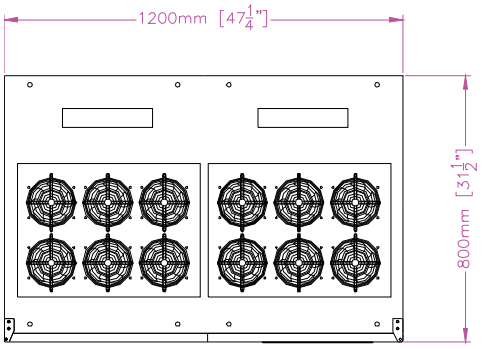
Physical Layout



FRONT VIEW



SIDE VIEW

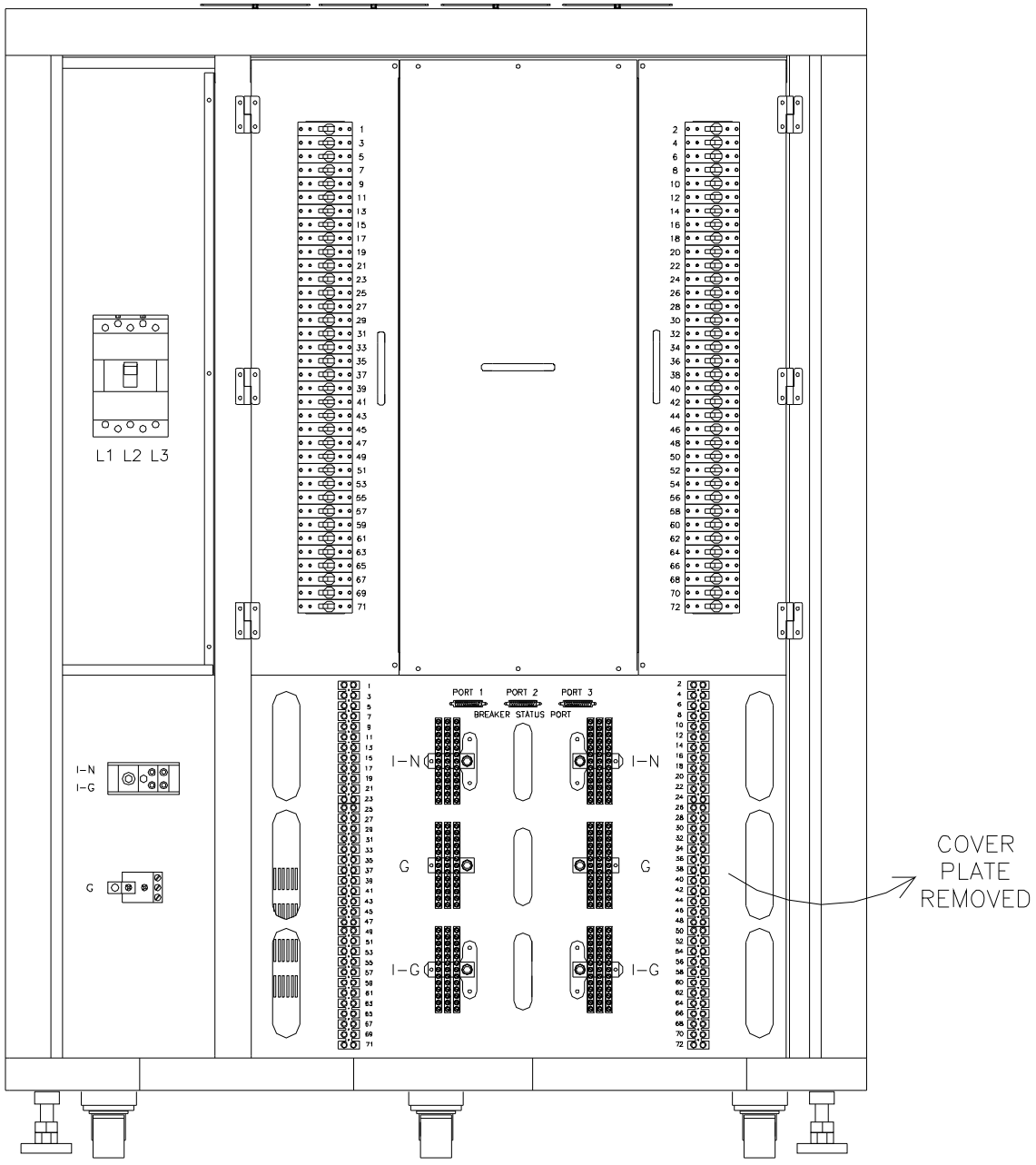


TOP VIEW

Wiring

Connect appropriate load wires through the gland plate to the corresponding terminal block number. Ensure wire is securely held in place by terminal block screw. Similarly for Isolated Neutral, Ground, or Isolated Ground wires ensure that they are securely held, and associated with the proper set of wires.

Connect main power through rear gland plate to the appropriate connections. Line wires will go directly to the main breaker, while Neutral and Ground will be attached to the marked distribution blocks, to be sent to the appropriate Buss bars.

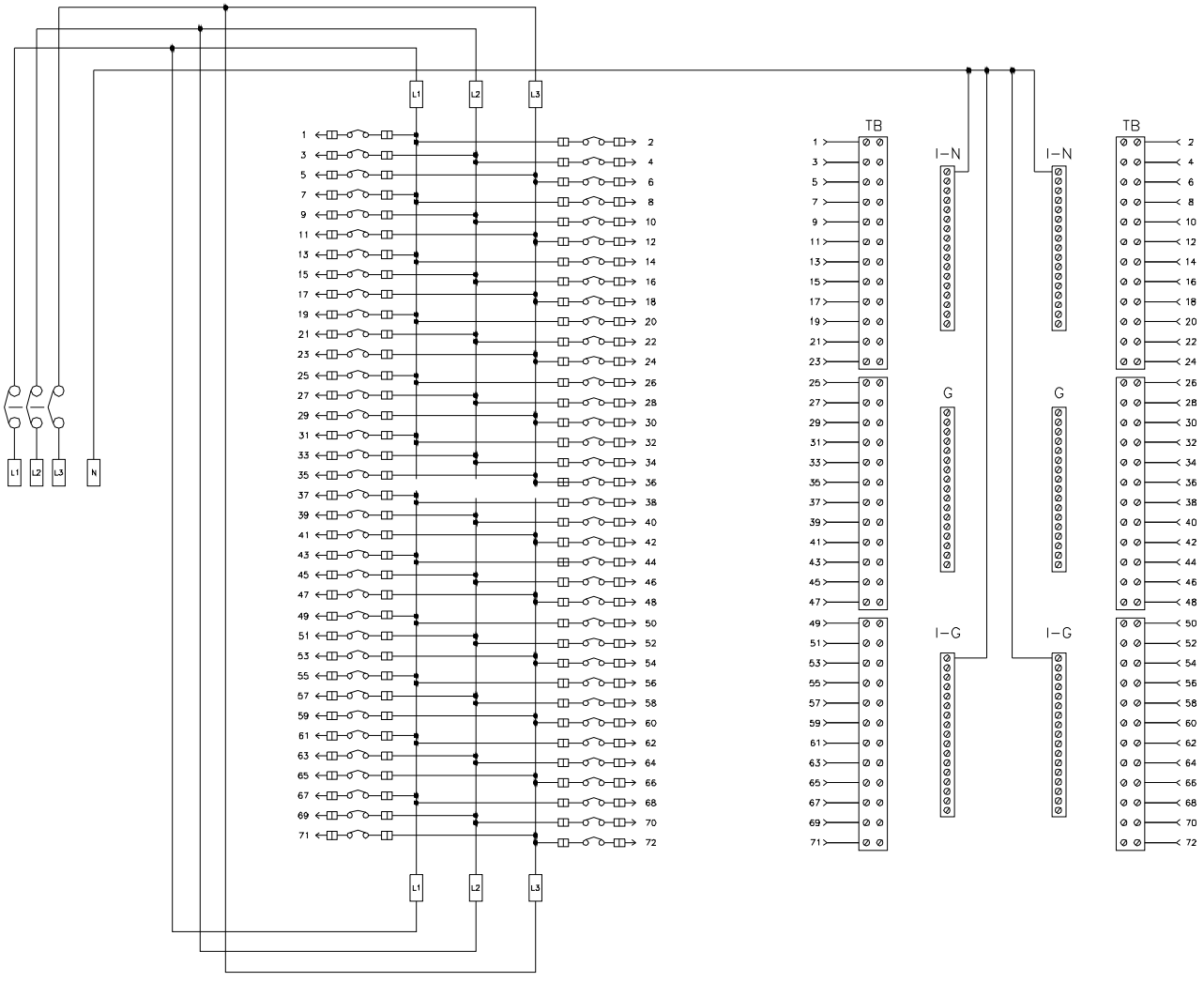


Internal Layout Example

Cable Selection
The cabling of the Genie Breaker Cabinet has to be sized according to the bypass system power rating. Sizing of circuit breakers, fuses and cables for input utility, output load must meet the requirements of local and national electrical codes.

WARNING
Inadequate cable size and over sized breakers can increase the risk of fire or damage connection cables and internal components.

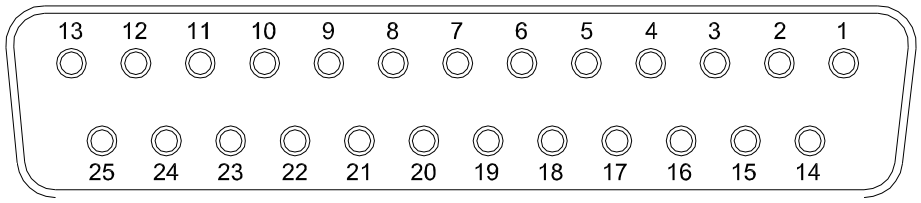
CAUTION: Do not apply utility power before an Always On representative has confirmed connections.



Generic Wiring Diagram Example

Breaker Status Port

The Breaker Status Port is a set of DB25 connectors, which use the Normally Closed contact on the breakers. (e.g. when the breaker is off, it is a closed circuit, when the breaker is on it is an open circuit). See below for the pin number corresponding to each breaker.



DB25 Pin Number Assignment

NOTE: When connecting, ensure that the connector is secured to the port by attaching the connector's screws to the port standoffs.

BREAKER STATUS PORT SCHEDULE						
Left Column				**Right Column**		
Breaker	Port	Pin		Breaker	Port	Pin
1	1	1		2	2	13
3	1	2		4	2	14
5	1	3		6	2	15
7	1	4		8	2	16
9	1	5		10	2	17
11	1	6		12	2	18
13	1	7		14	2	19
15	1	8		16	2	20
17	1	9		18	2	21
19	1	10		20	2	22
21	1	11		22	2	23
23	1	12		24	2	24
25	1	13		26	3	1
27	1	14		28	3	2
29	1	15		30	3	3
31	1	16		32	3	4
33	1	17		34	3	5
35	1	18		36	3	6
37	1	19		38	3	7
39	1	20		40	3	8
41	1	21		42	3	9
43	1	22		44	3	10
45	1	23		46	3	11
47	1	24		48	3	12
49	2	1		50	3	13
51	2	2		52	3	14
53	2	3		54	3	15
55	2	4		56	3	16
57	2	5		58	3	17
59	2	6		60	3	18
61	2	7		62	3	19
63	2	8		64	3	20
65	2	9		66	3	21
67	2	10		68	3	22
69	2	11		70	3	23
71	2	12		72	3	24

Generic Breaker Status Port Example

7. Breaker Reset Procedures

Reset a Tripped Circuit Breaker or Turn On Breaker

- Unlock and open door on the front of breaker cabinet.
- Find circuit breaker that is tripped or in the “OFF” position.
- Push circuit breaker handle to the “ON” position.

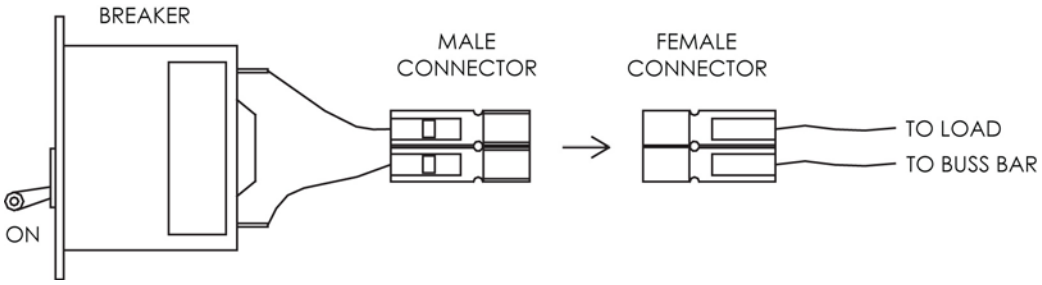
Turn Off a Circuit Breaker

- Unlock and open door on the front of breaker cabinet.
- Locate appropriate circuit breaker that is to be turned off.
- Push circuit breaker handle to the “OFF” position.

8. Breaker Removal/Replacement Procedures

WARNING: SHOCK HAZARD. ONLY QUALIFIED PERSONNEL SHOULD CONDUCT BREAKER REPLACEMENT PROCEDURES.

A circuit breaker may be replaced or added to the cabinet for upgrading or maintenance purposes.



To Remove a Circuit Breaker

- Unlock and open front access door.
- Locate and remove the two self tapping screws to release the breaker from the breaker frame.
- Pull the breaker out of the mounting frame until the connector is exposed.
- Cut the plastic tie strap that secures the connector, disconnect the connectors and remove the breaker.

To Add a New Circuit Breaker:

- Unlock and open front access door.
- Find an available circuit breaker bay. A cable lead is provided to quickly connect the special Genie circuit breaker.
- Remove the two self tapping screws that secure the bay cover.
- Disconnect the lead from the bay cover.
- Connect the available cable lead to the circuit breaker lead.
- Ensure a bracket is attached to the breaker before inserting.
- Push the leads into the circuit breaker mounting frame and mount the new circuit breaker into the circuit breaker frame with self tapping screws
- Test the circuit breaker and circuit for correct operation.

NOTE: Only use breaker doors if absolutely necessary

9. Contact Always ⏻n

Mailing Address:
Always ⏻n UPS Systems Inc.
100 – 150 Campion Rd,
Kelowna, BC, V1X 7S8,
Canada

Quality Assurance and Warranty Support:
P: (250) 491-9777 Ext 209
F: (250) 491-9775
qa@alwayson.com
www.alwayson.com

Additional Purchases or Upgrades:
P: (250) 491-9777 Ext 451
F: (250) 491-9775
sales@alwayson.com
www.alwayson.com

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